SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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Original Correspondence.

THE FAN AT TONDU COLLIERY.

SIR,—In the *Mining Journal* of Oct. 31 it is stated, in the Notes on the Collieries in South Wales, that the fan at Messrs. Brogden's Tondu Colliery is Nasmyth's, whereas it is one I made in the year 1862. Will you please allow this correction to appear in your next issue.—*Nov.* 4.

J. D. LEIGH.

ON STEAM-BOILER EXPLOSIONS.

SIR,—In a country where steam-engines and boilers are used to such an extent as in England, human life should not for a moment be placed in jeopardy by the use of imperfect instruments. There ought by this time, after our lengthened experience with boilers, to be some degree of security connected with the use of them. The great loss of life which has recently been caused by boiler explosions induces me to make some remarks on the construction and management of boilers, and suggestions for the prevention of accidents. Boilers are usually made with an adaptation to peculiar requirements. The principal varieties used are the plain cylindrical, one or two internal flued; the multitubular or locomotive; and the marine, with flat-sided internal flues. Four serious accidents have lately occurred at iron works, from which we may infer there is a peculiar danger connected with the use of that variety of boiler—invented by Mr. Rastrick, being heated by the flame from the puddling and balling furnaces—which it would be well to have explained and understood. The first accident occurred at the Mersey Iron and Steel Works, and caused seven deaths. The boiler in this case was 42 ft. 10 in. high, 6 ft. 9 in. diameter, flat bottom and top, two flues inside 2 ft. diameter, lessened in size at the top and bottom. This boiler was heated with the flame from one furnace; it was not sufficiently stayed at the ends, and was corroded to a great extent in the bottom plates; the thickness of one plate was only ⅛ in. This may be set down as the cause of the rupture of the boiler; the bottom plates, from the action of the flame, had become insufficient to bear the ordinary working pressure. The second explosion occurred at the Moxley Iron and Steel Works, by which 13 men and boys were killed. The construction of this boiler I will briefly describe; it was 22 ft. high, 10½ ft. diameter, hemispherical top, the bottom nearly so; a central tube, 4½ ft. diameter, opened through the bottom, 10 ft. high; from the upper part of this tube four side tubes branched off to the shell of the boiler; the shell was enclosed by brick-work flues to the height of about 12 ft., divided into four quarters, and to each quarter the flame from one of four furnaces was conducted. After impinging on the outside part of the shell, the flame passed through the side branch tubes, and united at the top of the central tube, passing down through it to a culvert underneath the boiler, and thence to the chimney. This boiler had been in constant use for 14 years. The fittings consisted of one stop steam-valve; one safety-valve, 4 in. diameter, loaded to 47 lbs.; one safety-valve, 5 in. diameter, loaded to 41 lbs. per square inch; one common float, one feed-valve for water, one blow-off valve for emptying the boiler and sludging. There was a steam-guage on the main steam-pipe, which was said to be incorrect; it showed 40 lbs. pressure; the actual ordinary pressure was supposed to be more. Corrosion had taken place to a considerable extent at the bottom end, which part had been frequently repaired, as well as other parts of the boiler. The cause of explosion in this case may fairly be attributed to the intense heat from a balling furnace, which is double that from a puddling furnace, coming in direct contact with the lower part of the shell of the boiler, at which point the mischief is supposed to have originated. This particular part of the shell had become so much deteriorated in quality by the impinging of the flame upon it as to be inadequate to bear the working pressure of steam. To obviate this evil a shield of brick-work might be constructed, to prevent the flame acting on that part of the shell, diverting the flame downwards, and coming afterwards into contact with the shell in a subdued way. The large diameter of this boiler, 10½ ft., was another source of weakness; this would, unless the bottom end were strongly stayed, and the upper part of the boiler also, have some effect in causing the rupture. The defects noticed in this boiler after its rupture would, no doubt, have been detected by a practised eye, and the several associations for insuring and for inspecting boilers periodically seem admirably adapted for the prevention of explosions. By putting forth every effort of engineering skill, each district imparting its quota of information for the general good, an amount of knowledge will thus be gathered which will have its practical effect in obtaining a better insight into the causes of these explosions, and some control in preventing their occurrence. The third accident to which I have referred occurred at the Elsecar Iron Works, near Barnsley, where a boiler of similar construction to that we have just described exploded, killing two men, and injuring several others; and the fourth occurred at the Ystalyfera Iron Works, South Wales, with an ordinary horizontal boiler.

To ensure absolute freedom from boiler explosions, a different form of boiler must be adopted to those commonly used; the form of boiler which has proved the safest, and has been most free from accident, is the multitubular. A modification of this I advocate, having a fire-box and a system of wrought-iron tubes, adapted for a lengthened period of work (say) 20 years. This boiler might also have side and bottom flues, so as to utilise, as far as possible, the heat given out from the products of combustion after passing through the small tubes; the cost of these would be greater than with common boilers, but the advantages in safety and economy of fuel would be considerable. The tubes may be 3 or 4 in. diameter, and I doubt not this can be accomplished, and be made to endure for the term stated.

It may be observed that marine boilers have proved very free from accidents; they are made principally with flat-sided flues, having numerous stays to strengthen them. These boilers are found not to be durable, lasting much less time than land boilers, which may be attributed greatly to the influence of sea-water, but tubular boilers are now much used in steam vessels, and are superseding the old form of boiler. The plain cylindrical boiler, with hemispherical ends, externally fired, is still most in use in this country; and this form of boiler has most frequently exploded; its failure has been attributed, in many cases, to a short supply of water in the boiler, and when the feed has been put on, some of the upper plates had become red hot, which generated steam to such an extent as to rend the boiler; but this supposed cause of mischief is not so common in later times. The frequent cause of the failure of these boilers is their extended time of work: many have been in use 30 years and more. The constant action and contact of flame on the lower plates causes such a deterioration in their quality as to unfit them to withstand the ordinary steam pressure. During this time that particular part of the boiler will have undergone repeated repairs, which have an injurious effect in one way, as many boilers have exploded just after being repaired and set to work, no doubt from the unequal expansion of the plates. The great length of boilers has an injurious tendency in this respect; if they were made about 20 ft. long, by 5 ft. diameter, their liability to injury from expansion and contraction would be greatly reduced, and they would prove more secure; this would only be a question of using two smaller boilers instead of one, the fuel used need not be increased. The fire-bars of cylindrical boilers should be at least 4 ft. from the plates, to avoid burning them; the flame carried and spread over the parts of the boiler beyond the fire-bars; the bars should be 4 ft. long, the fire itself about 12 in. thick. The fuel is first laid on the dead-plate in front; after it becomes coked it is pushed forward towards the bridge, when more fuel is laid on the dead-plate, an extra admission of air being allowed after the fuel is first applied. The gases disengaged from the fresh fuel come in contact with the hot fire at the bridge, and are consumed, and there is no production of black smoke. Attempts have been made to supply the fires with hot air, either near the door or at the bridge; this has the effect of causing more perfect combustion of the fuel, and less production of smoke. This heating of the air may be effected by passing it through a flue on each side of the fire, before entering the furnace. These are very important matters to be attended to, not only in the prevention of smoke, but in the saving of fuel, and require persons as firemen who have had a proper training to fit them for their duties.

FITTINGS.—The usual boiler fittings are common to nearly all the varieties of boilers; the most of them are provided as means of safety, and as safeguards against any accidental circumstance which may arise to cause an explosion, as follows:—The safety-valves, two to each boiler, should be 6 inches diameter, bearing surface ⅛ in. wide. One plain float, with a graduated scale and pointer, to show the exact position of the water level in the boiler; another float, with an alarm whistle in connection with it. Glass-gauge, also showing the level of water in the boiler. Feed-water valve, with a clack to prevent the return of water from one boiler to another; the end of feed-pipe should be 12 in. distant from the bottom of the boiler. Blow-off valve, or, more properly, a cock, which is not so liable to stick and leak, to let off the water, or for sludging purposes. The boiler should be sludged once or twice every day if the water is impure and deposits any sediment, as if this is allowed to accumulate it forms an incrustation on the sides and bottom, highly injurious to the boiler, and retarding the transmission of heat. Sludging as often as is required is found to be the best preventive against incrustation in land and marine boilers. One steam stop-valve and one steam pressure-guage is required for each boiler; in most cases only one steam-gauge is provided for a set of boilers, which is placed in the engine-house. It is essential to have steam-pipes of large size at a considerable height from the boilers, to prevent priming from one to another, or else a large steam chest. Steam-gauges are often found out of order, indicating less than the actual pressure; this is a matter which should be carefully looked after.

Those boilers with one or two internal tubes do not so frequently explode as the plain cylindrical boilers, though the former are liable to accident from the water becoming low, and falling below the top of the tubes; a fusible plug is usually placed on the top of the tube to guard against this, otherwise there would be danger of the tube collapsing, and the shell bursting when water is again admitted. Mr. Fairbairn's experiments on boilers of this class show that the diameter of the tube and shell should be in the proportion of 1 to 2½, and the tube should never be more than half the shell; of this size, and with equal thickness of plates, the tube is one-half the strength of the shell. Angle, or T-iron, rings are, therefore, rivetted on the outside of the tubes at intervals, which makes them equal in strength to the other parts of the boiler. The flat ends of these boilers should have plates one-half thicker than those of the shell, and be connected to them by triangular stays of angle-iron. Ordinary boiler-plate requires 23 tons to the square inch to tear it asunder, double-rivetted plates require 16 tons, and single-rivetted plates only 12·88 tons to rend them. The unequal expansion and contraction of the shell and flues operate on the ends; if these are too rigidly stayed they or the tubes must give way, especially in long boilers. The absorption of heat by the water is much facilitated by internal tubes, and generally they are safer than the plain cylindrical form. Should the feed of water have been neglected in any boiler, and the water so low that the plates have become highly heated, no water should then be supplied, the damper should be let down, the doors opened, and water thrown upon the fire. The use of mine water should be avoided, if possible, for feeding boilers, as it is often impregnated with acids, which destroy and corrode rapidly at any leak. The use of the surface water is always to be preferred.

The causes of the rupture of boilers are various; one may be bad quality of iron and bad workmanship, or from over pressure at a weak part of the boiler, in most cases occurring with old ones, in which the plates over the fire have become of a brittle and crystalline structure; inspection, however careful, cannot always detect this quality in the plates. Extreme expansion and contraction operate on the joints and rivets, which may cause leakage, and lead to corrosion. Water should remain 12 hours in boilers, and be allowed to cool down gradually before it is let out, and on re-lighting the fire should be gradually applied. It would be difficult to assign any limit to the time when a boiler should be thrown aside as insecure, because it might after many years' use from various circumstances be still in good condition, but it would, no doubt, be a proper precaution to have all boilers tested periodically by hydraulic pressure, and especially after they had undergone repairs, and up to a pressure considerably above the working pressure required from them.

The periodical inspection of all boilers would conduce greatly to the prevention of accidents; this is apparent from the results of the working of the steam-boiler associations. The boilers under their direct supervision have been almost free from accidents; it seems, therefore, that a general inspection of boilers would be the most important step that could be taken to prevent accidents and loss of life.

Nov. 3. C. E.

THE BROMFORD COLLIERY PROSECUTION.

SIR,—I have waited several weeks to see what Mr. Brettell, whose name appears to all the plans you published in the case of "Regina *v.* Cope," had to say about the sad exposure of—as it seems to me—a gross dereliction of duty; or what is worse, as considered by some, an attempt to impugn justice by false evidence and false plans; indeed, as all three differ, of course some must be wrong. Being an old surveyor myself, I am naturally jealous of professional honour.

SURVEYOR.

MECHANICAL VENTILATION OF COLLIERIES.

SIR,—As the subject of mechanical ventilation is at present occupying very generally the attention of those engaged in the management of our large mining establishments, and as it is one which requires very grave consideration, especially as many of the suggestions have been made by eminently practical men, a brief reference to some of the propositions may be interesting. Theoretically it certainly seems to be beyond question that the existence of a powerful furnace in a colliery giving off explosive gas must be attended with danger which would be unknown were mechanical ventilation substituted, yet it is a practical fact that the number of deaths, whether taking explosions only or all classes of accidents, is greater in Belgium, where the ventilation is exclusively mechanical, than is the case in Great Britain, where the ventilation is almost exclusively by furnace, and that, too, whether the deaths be considered in proportion to the hands employed, or in proportion to the quantity of coal raised. But its advocates, no doubt with much reason, attribute the failure of mechanical ventilation to the imperfect character of the machines used, and, therefore, continue their exertions to produce a machine which shall meet the requirements of the case. I heartily wish they may succeed, although I believe that even were the best constructed machine introduced the loss of life would not be materially lessened.

The earliest machine ventilator which attracted any large amount of attention was that of Mr. Lemielle, of Valenciennes, and the first of his machines put up in this country was that at the Ashton Vale Colliery, near Bristol. This was, I should think, fully 15 years ago, and it would be most interesting to learn how that machine worked, and what was the average annual cost of keeping it in repair, taking a period of (say) 10 years. Another machine, which was spoken very highly of, was that of Mr. John Nixon, put up, I believe, at his Navigation Collieries, in South Wales, and which was stated at the time to give an enormous current of fresh air. I presume this machine is still in use, so that perhaps Mr. Nixon would state through the Journal what he considers to be the result of the substitution of mechanical for furnace ventilation. The principles of the two machines differed widely from each other, yet each appeared equally well calculated to give good results. Lemielle's ventilator consisted of a cylindrical casing, with a six-sided rotating drum placed eccentrically within it, and provided with feathering fans or doors, with such a motion as to form a series of pistons, with a continuously forward stroke, the advantage of this arrangement being that the air is never beaten back, nor is its exit from the pit at any time interfered with; this is the same machine which Mr. Ellis Lever, of Manchester, was a short time since endeavouring to introduce in the North of England. Mr. Nixon's, on the other hand, was a gigantic horizontal cylinder, having an enormous piston mounted on wheels, and running on a small tramway within it, the entrance and exit of the air to each side of the piston being provided for by furnishing the cylinder heads with valves so hung as to close with their own weight, and not to be liable to get out of order. The pistons of the machine at the Navigation Colliery measure 30 ft. by 22 ft., and have a 7-ft. stroke, no less than 672 valves being provided for the passage of the air. At nine strokes per minute 166,000 cubic feet should be passed through, but this quantity is not nearly reached, in consequence of the leakage.

But although these, from their erroneous ventilating power, may be regarded as the first sensational machines, there was another which, for some time before, had been gradually obtaining favour in the western coal fields—that of Mr. W. P. Struvé, of Swansea, whose machine was precisely similar in principle, though not in construction, to that of Mr. Nixon. Whether Mr. Struvé's or Mr. Nixon's invention is entitled to the preference is a mere matter of opinion. Mr. Struvé's machine, which is now working at many collieries in South Wales, has the great advantage that the friction is reduced to the minimum. The pistons are made in the form of gasometers, the sides dipping into water rings. As the pistons usually work in pairs, they can be so well balanced that their weight offers no inconvenience whatever to their use. For large quantities of air, Nixon's arrangement may be the cheaper as to first cost; but for simplicity and efficiency in working, Struvé's is certainly worthy of the highest praise. Amongst the recent inventions of the same class of machine was that of Mr. Doull, of Great George-street, Westminster, which consisted of a cylinder, with an internal drum, as in Lemielle's, but with an improved means of guiding the doors. In Mr. Doull's machine, the outer ends of the doors are furnished with projections which run in slots in the cylinder.

The only other class of mechanical ventilator requiring notice is that which is undoubtedly the oldest—the fan. This was extensively used in the German mines more than 300 years ago, and yet it continues to be used without any material improvement having been made. Compared with machines of the Lemielle class, the fan has certainly the advantage that it is more cheaply constructed, and, being much less complicated, is less liable to get out of order; it is very questionable, moreover, whether, size for size, the simpler machine does not give as good results. Fans of all sizes have from time to time been put up at collieries in England, but they have often given place to furnaces when the workings have become extensive. Mr. Nasmyth erected an excellent fan at, I think, Earl Fitzwilliam's collieries, yet the invention does not seem to have been generally introduced. Indeed, fan ventilation appears to have been regarded in this country as only adapted for temporary purposes, until the introduction of the

Guibal fan, which some two years since created considerable attention in the Newcastle district. Instead of radial vanes, Mr. Guibal employs vanes which slope backward; but his main improvement, and that which gives his fan its principal value, is the provision of a slide valve to part of the casing, which can be opened or closed according to the requirements of the mine. Its first introduction was an adaptation at the Tursdale Colliery of the casing and chimney to a Biram ventilator. A complete ventilator was then erected at the Elswick Colliery, which has been in work without intermission for the last five years, and is giving entire satisfaction. There are now several ventilators on this system in the North of England, Derbyshire, Staffordshire, and North and South Wales. In most cases they have been subjected to accurate tests of their capabilities, which have invariably proved equal to the work guaranteed by the inventor; and no doubt can be longer entertained that this ventilator is equal to any conditions of mining ventilation. Messrs. Black, Hawthorn, and Co., of Gateshead, are now engaged in erecting several Guibal ventilators, and there is a probability of this useful machine being very generally adopted.

With regard to the mode of applying the fans when mechanical ventilation is employed, Mr. Jonathan Harrison, of Nottingham, proposes to use three fans, each of 30 feet diameter—two for the upcast pit for the ordinary course of ventilation, and the other for the downcasts, 2 ft. 6 in. of which is partitioned off from surface to the bottom to permit of compressed air being conducted into an intake driven parallel with the ordinary intake. Mr. Harrison proposes to divide the workings into sections independent of each other, so that in the event of accident 60,000 or 70,000 cubic feet of air per minute could be at once supplied to the intakes, and thence carried into any section of the mine, thereby rendering explosion impossible. With the ordinary upcast fans Mr. Harrison calculates he will get 505,440 cubic feet per minute with 150 revolutions, 252,720 cubic feet with 75 revolutions, and that 200,000 cubic feet per minute would be the ordinary quantity with intakes 65 feet area, and the returns at 70 ft. area. I shall be most happy to learn through the Journal that some colliery owner has been induced to adopt Mr. Harrison's suggestions, and that the large volume of air which he promises has been continuously and economically secured. H. H. S.

Barnsley, Nov. 4.

THE WEATHER, AND COLLIERY EXPLOSIONS.

SIR,—The mean temperature this year was above the average in every month to September inclusively. The mean temperature of October was only 46°, or 3° in deficit. Hoar frost prevailed on the mornings of the 18th, 19th, and 20th, when the thermometer, at 4 ft. above the ground, registered 29°, 28°, and 27° respectively. In the valley of the Rea the disparity of temperature was about 2° lower. Rain was collected on 13 days in October, and the total deposition was 2½ inches, of which 0·92 inch, or about 90 tons per acre, fell on the sixth day. There was a severe gale on the evening of the 24th. At 5·35 P.M. the force of the wind was 19 lbs. to the square foot. The barometer declined that day 3-5ths of an inch in 10 hours.

The oscillations of barometrical pressure and temperature since the 23d day have been considerable, and are foreboding indications that should these rapid changes be repeated in November, the conditions likely to ensue in collieries are just those which have of late years induced the most terrible explosions. The great depression of atmospheric pressure on the 24th was recovered on the following day. The highest barometrical reading in the month was on the 28th day, at 8 A.M., and yet before midnight it was down 3-5ths of an inch, and the fall was made up on the 29th.

Temperature was 9° higher on the 24th than on the preceding day, and on the 27th 12° lower, while on the 30th it had recovered. The wind all this time was continually changing between S.W. and N.W., with rain and fine weather in alternate succession.

Now, it is of the most vital importance that the utmost prudence should be exercised in our collieries during such frequent atmospheric vicissitudes, especially in those pits where ventilating shafts are placed only at long intervals. The men ought to be frequently warned not to use naked lights, and to adopt every practical precaution, in order to avoid those fearful disasters from fire-damp, the sad consequences of which are more to be dreaded, from the vast amount of human life which has of late years been thus sacrificed, than all the calamities in the same years on the railways in the kingdom.

Twelve months ago, when the atmospheric conditions were much the same as recently, I had the honour, in your widely-circulated Journal, to warn Inspectors of collieries, and others having the control of such places, of the danger then existing, and in less than a week afterwards the newspapers thrilled us with horror when we read the harrowing details of the dreadful explosions in South Wales, Dudley, Silverdale, and other mining districts.

I would respectfully advise the Inspectors of collieries during the winter months to watch closely the movements of the barometer and the thermometer. Depend upon it, the weather has much more to do with the primary causes of these explosions than is, perhaps, generally supposed. A sudden rush of cold air, followed as quickly with a warm, thick, foggy atmosphere, and a rapid relaxation of atmospheric pressure abruptly succeeding high pressure, should give occasion for serious apprehension. With such frequent and sudden atmospheric changes, the shafts cannot transmit into the pits an equal distribution of air, as regards its dryness or dampness, heat or cold.

Without the greatest possible precautions, therefore, conditions must at times exist like those I have already explained, which may at any moment induce explosions most terrible to contemplate in their consequences.—*Birmingham, Oct. 31.* T. L. PLANT, F.M.S.

MINERAL PROPERTIES—CREATION OF MATTER—No. XI.

SIR,—The creation of matter, as we have intimated, differs according as we take it from a chemical or a philosophical point of view. The chemist traces matter back to its primary constituents; the philosopher traces it back to the first natural point. Let us try to illustrate this, as it will be of great help to us in treating of the formation of different minerals.

Among philosophers who have treated on this subject Swedenborg occupies a prominent position, although, of course, he is not to be compared with our own great luminary, Sir Isaac Newton. However, as he is somewhat easier to be understood than Newton, we will see what he has to say. He traces the commencement of all matter, in his "Principia," to the first natural point. This derives its existence from the Infinite. From this natural point comes the first, or simple, finite. From the first simple finite is derived the second finite. The first finite has an active; this forms the first elementary particle. The first elementary particle is compounded of finites and actives. Then we have a third finite, and its active; this, together with the actives of the first and second finites constitute the second, or magnetic, element of the world. After we obtain these we obtain everything—all that is necessary for the animal, vegetable, and minerable kingdoms. Let us see, in a very brief manner, what is to be said on each of the above things.

The first natural point is that which was first created. It had its existence from the Infinite. The first ens, like the infinite, is not subject to the laws of geometry; because the infinite having no boundary cannot be measured, neither can the first natural point, as it has but one boundary. The Infinite, as it has been well said, has His centre everywhere, but His circumference nowhere. The point in mathematics is said to be without length, breadth, or thickness; or, in other words, the point cannot be subjected to any law of geometry. Yet it is said that a line is made up of points, because the extremity of a line is points; therefore, by taking away point after point from the line, we could take away the whole line. Now, a line, in geometrical language, is length, without breadth or thickness. Consequently, we have here that which is without length, breadth, or thickness, capable of producing length. Again, from a line we can produce any superficial figure; so that that which is length only is capable of producing length and breadth. Also, after we have a superfices we can produce any solid figure. It is, in a manner something like this that philosophers look at the creation of matter. Of course, the above reasoning is not correct, because the point, however small, must be something, else it could never form a line, as "nothing produces nothing." Yet the state of our understanding is such that geometricians—and they take little for granted—are obliged to refer us to the simple point, without being able to finite it by figures or space, for the origin or all their figures and space. Here, then, philosophers and geometricians agree in ascribing the origin of all things to a point, of which point they cannot tell us its size, weight, or form. Yet, although this simple point has neither size, weight, or form, it must possess something. What does it possess, then? It possesses, in the first place, *motion*. Nothing can exist without motion. It is indeed difficult for us to conceive of motion without being in connection with some substance; but that motion must be something within the thing itself, and therefore invisible to us. We see merely the effect of motion; the motion itself is latent. Now, motion is the life of everything; everything that is at rest produces nothing. Whatever is to be produced must be produced by a mode or motion. In things limited, or finited, every modification consists in a variation of limits, and to produce a variation of limits there must be motion. "Therefore," says our authority, "it follows that this first simple ens, or point, was produced by motion: and since everything is derived from the Infinite, it would follow also that this natural point, or simple ens, was produced by motion from the Infinite." Hence, if this point were produced from the Infinite, there must have been a will to produce it; there must, also, be a design that the effect produced should be capable of producing a series of modifications. Since this is the case, a point is "A first simple ens, and the first existing from the Infinite by means of motion; and thus that, in respect to existence, it is a kind of medium between what is infinite and what is finite."

This point is simple—that is, it admits of no degrees. It has one boundary only. Therefore, because it has only one boundry, it must be the first ens, or seed, of things finited; because where there are several boundaries there must be one. This point is also a medium between what is finite and infinite. It is a medium both as to existence and origin; for it first originates from the Infinite, and then gives origin to things finite. This point is produced immediately from the Infinite. The Infinite is the cause, and modifies and sustains the point. The point cannot be conceived to have any parts, and consequently it is indivisable; nor can it be said to fill space, unless it be space simply understood.

The point also has conatus, or effort to motion; and this motion is of the most perfect kind. The figure of the motion is perpetually circular; and since it perpetually circular it must be spiral, because a perpetual circulation is the same as a perpetual spiral. The circle is the most perfect of figures, as the circle has only one boundary line, whilst every other kind of figure must have several, besides having angles, which the circle has not. The motion also is reciprocal—that is, it flows from the centre to the periphery, and from the periphery to the centre continually; and no other motion except the perpetual spiral can be conceived to be such. The point consists in this motion. However, as it is pure motion, and as there is nothing substantial to be acted upon, we cannot conceive that there is any flux and reflux from the centre to the circumference, and reciprocally from the circumference to the centre, as there is in finites, but only a conatus tending to such motion, and a figure most exactly resembling it. Now, as pure motion admits or no degree of celerity, a point cannot be said to have motion, unless it be understood that it is in the centre and circumference at the same time.

Let us sum up what we have said of the first natural point. It is produced from the Infinite, and is a medium between the Infinite and finite, and as such the seed of all things. It is not itself finited, as it has only one boundary. It consists of motion, was produced by motion from the Infinite. This motion in the point differs from motion in finites, because it is a conatus, or an effort to motion in the point. The conatus tends to a perpetually spiral figure, as being the most perfect.

We have traced the point thus far. I purpose in my next letter —which will be the last on the Creation of matter—to show how other things can be produced from this point. S. JENKINS.

NORTON'S PATENT ABYSSINIAN TUBE WELLS.

SIR,—In last week's Journal I notice you give a short account describing the driving of my Patent Tube Wells, which took place at Plaistow on Wednesday, Oct. 28. Besides exhibiting the rapidity with which these wells can be driven by my process through hard gravel, which abounds in the locality chosen, my principal object on this occasion was to illustrate the method I adopt when water has to be raised from below the reach of an ordinary suction, or lift pump. For this purpose I simply convert a small portion of the tube itself into the pump barrel, fixing a valve therein, and lining it with copper, the bucket being worked in this barrel by a rod connected to the pump-handle above the surface of the ground. The portion of the tube forming the pump-barrel I place within 25 feet from the point of the tube; any length of tube can then be added above this barrel, and a corresponding length of rod is all that is required to raise water to the surface from any reasonable depth. This was clearly demonstrated upon the occasion in question, not, however, by driving 60 or 100 feet of tubing into the earth, but by elevating tubes into the air, and working the pumps from a ladder. As there are erroneous impressions existing about my wells being of no use beyond 30 feet, owing in some measure to errors which crept into the official reports in connection with the Abyssinian expedition, your inserting this explanation will oblige— J. L. NORTON.

Belle Sauvage-yard, Ludgate-hill, Nov. 5.

WATSON AND BAKER'S PATENT TUBULAR WELLS.

SIR,—In confirmation of the favourable opinion expressed in last week's Journal concerning Watson and Baker's Patent Tube Well experiments, the trial which took place at Richmond Villas, on Wednesday, was attended by the anticipated success. The experiments commenced at 12 o'clock, and lasted until 4·30. The tubes were driven in this instance on an improved method by means of a triangular shear legs of gas tubing, having a pulley block to lift the weight, or monkey, this having a spindle in the centre to guide it in the tube. The most difficult soil was pierced through, and a plentiful supply of water obtained at 13 ft. A few yards on the opposite path the water was 18 ft., and in this instance the deep-well system was illustrated by having a pipe screwed on to the tube, and water pumped to the height of 40 ft., all present expressing their confidence in the success of this principle; and, as one gentleman stated, in this case there was no rebound, this being on the principle of a gimblet, whilst the other system was like a bradawl. G. WATSON.

Victoria-terrace, High-st., Upper Plaistow.

THE GOLD FIELDS OF SOUTH AFRICA.

SIR,—As considerable interest appears to have been excited in England by the reported discovery of extensive gold fields in the interior of South-East Africa, and as much apprehension prevails regarding the best route to the auriferous territory, will you permit me, through your columns, briefly to point out the shortest and most advantageous way of reaching the gold country? There can now be scarcely a doubt that a large region, bordering and extending to the northward of the River Limpope, has for ages yielded gold to the natives, who have obtained the precious metal by means of the simplest processes and the rudest appliances. The prospecting party which left the Transvaal territory in March last returned in August with a few ounces of gold dust and 7 cwts. of fair gold-bearing quartz. The return of this small pioneer party was caused by internal dissensions, want of proper apparatus, and other difficulties.

When I left Natal, in September last, several parties of colonists were preparing to start for the gold fields. They would take with them quartz-crushing machines, and other requisites. The road through Natal presents many incomparable advantages over any other route. It is very much shorter and more direct, in the first place. The rivers are bridged, and an abundant supply of pasture exists all the way. Water also is plentiful, and has not to be purchased at the rate of 2*s.* 6*d.* per bucket, as is occasionally the case along other routes. Produce and provisions of all kinds are cheap and abundant. The scenery is pleasant, and often charming. Good sport is to be had. For half the distance accommodation at roadside inns may be obtained at present.

It has been said that the route *via* Natal, though undoubtedly shorter, is rendered less advantageous by the difficulties of the Drakenberg mountain range, and the prevalence of the Tsetse fly. Both drawbacks are purely imaginary. An excellent road crosses the Drakenberg, which may be traversed almost at a canter, and as for the "fly," it is so easily avoided that it never enters into the calculations of our regular hunters and traders, who leave Natal yearly in large numbers to pursue their avocations in districts which lie either on the way to or in the immediate neighbourhood of the future diggings.

It may not be out of place to state that during the month preceding my departure from Natal gold had been found in small nodular particles in the beds of the rivers Umtwalumi, Amahlongwa, and Ifafa, on the coast of Natal, and within 80 miles of the seaport of that colony —Durban. The German explorer, Carl Manch, had pronounced his belief, a year before, that the district in question was auriferous, and a systematic search, under the aupices of the Government, had already been instituted. Unfortunately, the public revenue is wholly inadequate to bear the strain of any special expenditure for the prosecution of such investigations.

I enclose a copy of a map published at Natal just before I left, and compiled from sources of information not utilised so far in any other map of that part of Africa. A glance at that will at once show how very much more direct is the route through Natal than any other. I shall be happy to afford information on this subject, to which I have devoted much attention for some time past, to any persons interested in the matter. JOHN ROBINSON, F.R.G.S.,

Member of the Legislative Council of Natal.

22, Abbey-gardens, Abbey-road, St. John's Wood, Oct. 27.

CHONTALES GOLD AND SILVER MINING COMPANY.

SIR,—I observe, by a paragraph in last week's Journal, that I am reported to have stated that Mr. Belt computed to pay the shareholders 50 per cent. on their outlay. My statement was, as may be seen in my speech, that Mr. Belt calculated, in his estimate for the current year, to make 50 per cent. profit *on the cost of working*.

Gresham House, Nov. 4. G. NOAKES.

THE MINING REGION OF NEVADA, U.S.—No. III.

SIR,—On the eastern slope of the "Toiyobe" (an Indian word, meaning range of hills), and south of Austin, were organised in 1863 a number of districts, covering that side of the mountain almost continuously for a distance of 75 miles. Throughout its southern extent the mountain rises from the valley of Reese River on the west, and Smoky valley on the east, and attains an altitude of 2000 to 5000 ft. above them. From valley to valley, through the base of the mountain, the distance is from seven to ten miles. From its high peaks, and through its deeply chasmed sides, run many streams of water, affording good sites for mills.

Of the numerous districts organised on the eastern slope of the mountain, that of Twin River is now the most prominent. It is in Nye county, about 50 miles south of Austin, and is at present regarded as one of the most important districts in the State. It receives its name from two pretty streams on the southern border, which, flowing through deep and rugged canons, enter the valley near each other, and continuing parallel for some miles, sink in the plain. The principal mines are situated in Wisconsin, Ophir, and Last Chance canons. The "Murphy" is the only developed and productive mine in this neighbourhood, and its success has given celebrity to the district. For the year ending Dec. 31, 1867, the Murphy Mine produced in bullion the sum of $782,000. For the last quarter of the same year there was only extracted from the mine 896 tons of ore, which yielded on an average $146 per ton. This mine was located by John Murphy, Joseph H. Pattey, and others in 1864, and is 1000 feet in length. Its course is north and south, dipping to the east at an angle of 46°, and the lode is about 20 feet in thickness. In Wisconsin, Ophir, and Last Chance canons are located many mines, which, in the opinion of experts and miners, are fully equal, if not superor, to the celebrated Murphy. Taking into consideration the fact that the Twin River district is, as a mining region, yet in its infancy, and that there is not another district in the State of Nevada where the mines approximate in value to the mines of this section, or produce uniformly throughout an extended region of country even one-half of the amount of bullion in proportion to its inhabitants and the machinery employed, I may safely conclude that this district presents inducements for the investment of capital, with the assurance of ample and speedy return that is seldom met with.

I have examined some 100 different locations in this district, and although the great majority of them appear to be true fissure lodes, yet, from the small amount of development done upon them, it would, indeed, be difficult to report without doing many of them injustice. Those that are partially opened are the Glasgow, Wellard, Belmont, Anna Morgan and Lawrence, Baker, Saratoga, Andy Johnson, Black Hawk, Northern Light, Bullion, Manitta, Vanderbilt, and others. This last-named mine is the marvel of the district. Its croppings rise above the surface about 60 ft. for a distance of 200 yards; it is from 50 to 80 ft. thick, and millmen, who are familiar with the ores of this district, assert that the entire mass of "outcrop" will pay for working. I had an assay made from a piece of the ore which was taken from the croppings about 40 ft. above the surface, and it assayed $894 per ton. The mines of this district are the most promising I have ever examined. Some of those I have mentioned contain on the surface exactly the same character of ore as was found on the Murphy; and it is impossible to distinguish one from the other. In fact, ore taken from the Vanderbilt and Saratoga Mines, and exhibited in Austin, was pronounced Murphy ore.

So far as Nevada is concerned, her future is already an assured success. With such stores of "hidden treasures" within her bosom, there seems no limit to her power and prosperity, and the reflex influence of these great mines of precious metals upon the older portions of the world, will be as great as that exerted upon the region which contains them beneath its surface. MINER.

Austin, Nevada, Oct. 10.

WEST CHIVERTON, AND GREAT LAXEY.

SIR,—Can I be informed upon what grounds there is such a great discrepancy in the market value of those equally eminent lead mines, West Chiverton and the Great Laxey? West Chiverton, with the price for the last few months quoted at 62, pays a dividend of 8*l.* per share yearly, being 13 per cent., besides having large reserves, and, according to a statement made at the quarterly meeting in May, accumulating at the rate of 3000*l.* monthly; also, by the latest account, the lode at the deepest level cutting rich; further, with a balance of 9000*l.* in hand, and the management most unexceptionable: whilst Great Laxey is standing at 20*l.* per share, on which an annual dividend of 2*l.* is paid, or 10 per cent.; therefore, West Chiverton shares would require to sell at 80*l.* to be placed on the same equality for dividends. Is it, for one reason, that full and glowing reports of the Great Laxey meetings are given twice a year in the Journal, to be seen and known of all men, whilst the briefest and baldest reports are inserted of the meetings at West Chiverton; the committee of the latter going on the opposite principle, apparently, of hiding their light under a bushel? I shall be glad, however, if some well-informed of your readers will afford me some valid explanation of this striking anomaly.

A DISTANT SHAREHOLDER.

THE ROYALTON TIN MINES.

SIR,—It is cheering, after the painful depression that has for such a time pervaded all English mining, to see animation returning to some of the districts, and, although it is sometimes doubted whether speculative copper mining will ever regain its former magnitude in Cornwall, in face of the increasing competition that the Chilian, Spanish, and other foreign mines, are obtruding, yet it is admitted by all metallurgists that tin mining must vastly increase in commercial importance in this country, and this conviction is founded on the absence of competitive elements, and the increasing demand from our colonies, as well as our foreign customers. Actuated by this conviction, most of the Cornish tin mines are eagerly securing tin grants, and in making their choice much attention is being devoted to the Roche district, whither they are mainly attracted by the success of the Royalton Tin Mines, whose vast resources are now becoming so well known to the public. Already three companies are in possession of those mines, which are named Royalton, East Royalton, and West Royalton; from the former highly profitable returns are being made monthly, and similar results from East and West Royalton are awaiting the completion of the stamping machinery. These mines are situated on the slope of the hill closely adjacent to the Goss Moors, an extensive piece of waste land celebrated for its rich tin streams, which have been worked from a very remote date, and are estimated to have returned upwards of a million pounds worth of tin ore. At the Royalton a 60-horse power steam-engine, which is driving at present 48 heads of stamps, and pumping the water from the bottom of the mine (25 fms.), is already erected, and preparations being made to erect a further 48 heads. The source of production of these three properties is one vast tin-elvan course, averaging 70 ft. wide, running through the entire length of the three mines, embedded in a soft stratum of highly mineralised clay-slate, close upon the junction with the granite, and containing a profitable quantity of the finest quality tin ore disseminated in a remarkably regular manner throughout its entire bulk. The fact of the lode being productive to the very surface, and so large, admits of its being raised at a very trifling cost, as instead of the usual and costly mode of sinking shafts, driving and draining the ore, this can be worked by open cuttings, quarrying it out, and tramming it directly to the stamps. At East Royalton an adit level has been driven to the intersection of the lode at a depth of 25 fathoms, which will obviate the cost of pumping, and give it this advantage over Royalton and West Royalton. JOHN HOSKING.

THE GOLD FIELDS IN NEW ZEALAND.—The effect of the discovery of the Thames gold fields is further developing a long-established industry in Auckland—shipbuilding. There is now a fleet of nine steamers, costing 30,000*l.*, and manned by about 100 men. These steamers have been built entirely of New Zealand material. Since Feb. 14 to July 31 they have conveyed to the Thames 18,000 passengers, and from the Thames 14,000. The gold forwarded was 22,000 ounces. The aggregate tonnage at Shortland during the same period was 28,500, independent of the fleet of small sailing vessels, which had been rather unprofitably employed along the coast previous to the gold discovery at the Thames. The news from the gold fields continues to be of a very satisfactory character. The rapid increase in the number of miners, and the augmented value of the shares in the claims, satisfactorily proves the richness of the fields. Provisions are somewhat high in price, but this will soon be remedied. The following facts will prove the progress made during the past year:—The area now available is 340,000 acres, or about 700 square miles. The number of claims taken up for quartz mining amounted to about 1500, occupying an area of 10,000 acres. The actual sum of money invested in shares in these claims amounts to 80,000*l.*, giving employment to 6000 men. The value of permanent wooden buildings in Shortland is about 30,000*l.*, and in Graham's Town about 20,000*l.* The value of the quartz-crushing machinery driven by steam on the Shortland branch of the

gold field is 16,000*l.*, and of the machinery ordered and now being set up 22,000*l.*, thus giving a total of 460 horse-power, capable of crushing 400 tons of quartz daily, which, at an average yield of 3 ozs. of gold to the ton, would give 1200 ozs., at 50s. per oz., say 3000*l.* per diem, or nearly one million sterling per annum. The owners of the crushing-mills employ permanently 400 men.—*New Zealand Examiner.*

MINERAL WEALTH OF THE MARITIME ALPS.

An interesting paper on the coal, iron, and other mineral deposits in the districts of St. Sauveur, Valdeblore, and St. Martin de Lantosque, in the Maritime Alps, has recently been read before the Manchester Geological Society, by Mr. P. S. REID, in which he explains that the mines of St. Sauveur and Valdeblore are situated on the French and Italian frontier, about 36 miles from Nice, on the Imperial road towards Barcelonette, in the Basses Alps. The village of St. Sauveur, which is situated close to the Tinée, a rapid and considerable tributary of the river Var, is 1630 ft. above the level of the sea, and a mountain about two miles to the north-east attains a height of 4467 ft. St. Dalmas, also a short distance to the east, is 4942 ft. above the sea level. These altitudes, although indicative of an extreme degree of cold in our latitudes, present no difficulty with reference to temperature in that district. All sorts of crops flourish, and even the vine luxuriates in the neighbourhood, at nearly 5000 feet above the sea. The predominant formation is, in the first place, the Jurassic Limestone, under which, and reposing on the mica schist, are metamorphic rocks, answering in a great measure to our New Red Sandstone formation, and in these the principal deposits of copper are found.

Beginning with the mines of Cluchlier, near Valdeblore, the whole structure of the mountain appears to consist of a series of red schists, alternating with parallel beds of white sandstone passing into quartzite, the mass being several hundreds of yards in thickness, and resting on massive aggregations of gneiss, which come to the surface at Millefonts, and are there found to be prolific in veins of iron ore. From the section given by Mr. Reid, it appears that the veins dip at an angle of about 45°, and that a gallery has been driven to intersect the whole of them. The lower bed consists of talcose schist, mixed with nodules of quartz, grains of carbonate of copper being diffused throughout the whole; fragments of Phillipsite, or streaked copper, are also disseminated through it. The mean thickness of the seam is about 5 feet. This intermediate deposit is composed of a bed of sandstone passing into quartzite, spread through which are found numerous nodules of Phillipsite, and broad efflorescences of carbonate of copper, the average thickness being about 2 ft. 8 in. The upper deposit appears to be the most important, containing, as it does, Phillipsite, or streaked copper, forming veins, nodules, and lenticular masses in the schists, which are in this bed frequently spotted with carbonate of copper, constituting alone a poor but workable mineral. The mean thickness of this seam is 1 ft. 4 in. Close to these outcrops are old workings of great antiquity, belonging, in fact, to an era very remote, as no document or tradition exists with respect to them. Common rumour attributes them to the Saracens, a very industrious people, who are known to have occupied the Alpes Maritimes during the eighth, ninth, and tenth centuries of the Christian era. At about a mile to the north-west of the "Saracen's Gallery," in the quarter of Tremissieres, a large vein of iron ore, much impregnated with the carbonate of copper, is found, which renders it probable that on going deeper the iron may pass into copper, as is found in some of the great German veins similarly placed, where masses of ore are found taking the form of a lode, enclosed in gossan, as in Cornwall.

From the records of the French School or Mines, it appears that the cupreous breccia gives an average yield of copper of 3·2 per cent.; the copper schist, 4·5 per cent.; and a selected sample of Phillipsite, 53·9 per cent. It is curious to remark that during the last 40 years more than one attempt has been made to work these copper ores on the place, and that each endeavour to do so has failed, from those working the mines being infatuated and allured with the great yield of the Phillipsite. Hence their efforts were directed entirely to the search for this ore, to the utter neglect of the inferior but much more abundant qualities. Till now the cupreous breccia and the copper schists, holding the metal chiefly in chemical, in contradistinction to mechanical, solution or mixture, have been thought, *and properly so*, too poor to be transported and sold to smelting works at Marseilles or in England; whilst their being chiefly ores of copper in solution, it has been inconvenient to treat them by washing on the spot, because by such a process the greater part of the carbonates would pass away with the stream which carries off the gangue in the washing process. For the same reason it is a question whether similar treatment to that of the ores of Mansfeld would be effectual, as in the last-named the schists are enclosed in a bituminous shale, which permits of their being baked in heaps by means of their own fuel.

The most likely way of working these ores would appear to be precisely that adopted at Alderley, with some modifications suggested by their calcareous character. With reference to the rich ores, they are chiefly Phillipsite, which is found mixed with certain proportions of sulphide and carbonate of copper. The usual gangues are clay-slates and quartz, but there are also found in them accidental fragments of other minerals, such as sulphate of baryta, fluor-spar, specular iron ore, and chlorite. As before stated, their nature is such that red copper and extremely rich mattes have resulted from them in the first melting. This is to be attributed to the reaction which occurs between the sulphur and the oxide of copper during fusion, and with such qualities it is needless to say the market is assured in England, no matter what the cost of carriage may be, since similar ores bear importation from Australia. Immediately to the north of the village of Rimplas, and on the opposite slope of the mountain called Cluchlier, another formation of copper has been discovered. In the writer's opinion these two deposits of copper, though differing greatly in character, will ultimately be found to be identical. It is well, however, to remark that the Rimplas formation partakes much more of the nature of the Cornish copper mines than that of Cluchlier. In it you have a tolerably well defined vein, or lode, in one place, with its usual enclosing gossan or hydrated oxide of iron. It is placed about 2788 ft. above the sea level, and is separated from the Tinée (a river which, though called a tributary of the Var, is in reality its principal stream) by a distance of 2000 yards. This stream being the southern limit of the concession, and having a volume in the driest season of 424 cubic feet per second, presents great facilities for water-power, in the washing and manipulation of the ores, both with reference to Rimplas and Cluchlier, and the Imperial Route, which passes the foot of the mine, will further facilitate its access. Geologically considered, the enclosing rocks are precisely the same as those of Cluchlier. The mean direction of the beds being north 20° east, with a dip of 32° towards the east. Several metalliferous and carbonaceous deposits crop out on the side of the mountain, and both here and at Cluchlier, in the valley of La Boulinette, are found two distinct beds of anthracite coal, of an excessively sulphurous nature. These coals do not appear to me in either case to be conformable with the red schists forming the enclosing rocks of the copper formation, but to belong to the Jurassic series. They abound in nodules and kidneys of iron pyrites, and in many places the coal, where exposed to weather, is covered with efflorescences of nitrate of potash or soda. According to the analyses of Mr. John Arthur Phillips, the produce for copper of the several kinds of ore is—cupreous breccia, Cluchlier, 1·51 per cent.; streaked copper, 44·70; cupreous schist, Cluchlier, 13·87; broken ore, Cluchlier, 34·10; and copper pyrites, Rimplas, 15·76 per cent.

About 16 or 20 miles to the south-west of Valdeblore, or Cluchlier, another deposit of copper is found, running over vast extents of country, in much the same kind of rocks as at Cluchlier and Rimplas; and over this large intervening space Mr. Reid does not doubt the copper-bearing rocks will be found continuous. These mines are being worked by English capitalists. The geological position of the copper seams is similar to that of the Cluchlier seams; but the ores are of a totally different nature, the mineral being, as it were, mechanically deposited in the grey sandstone rock, in contradistinction to the chemical intermixture as shown at Cluchlier, and as found at Alderley. A simple washing and crushing suffices to clear off all extraneous matter, and the ores which in the bed contain only 2 per cent. of copper on the average, are thus enriched to 20 per cent. in the state of schlich, and in this form it is barrelled and sent off to Swansea from the port of Nice. In the same district are found a great variety of copper ores, amongst the rest red oxide, black sulphuret, native copper, and grey argentiferous copper. The schlich obtained from some of the washed ores sent to Swansea yielded—copper, 40 per cent., and silver 29¼ ozs. of that metal per ton of ores smelted. The Government engineers of Italy, of which country all these deposits formed a part till within the last few years, consider the copper deposits as greatly analogous to those of Mansfeld; but Mr. Reid does not think so, except in the mere deposit in seams, in contradistinction to veins; but the question is an open one.

About three to four miles north of the villages of La Bouline, La Roche, and the Cluchlier Mines, is situated the mine of Millefonts. Numerous outcrops of rich iron ore are traceable (extending over 600 yards of space) by excavations cross-cutting several yards of ore in eight distinct veins. The concession occupies the northern slope of the pasture land of the mountain on what is called the "Col des Ferieres," on account of it exceeding richness in iron ores. The minerals present two principal varieties—micaceous specular iron ore, and compact red hematite. These ores are very pure, and treated in a charcoal crucible have yielded 72 per cent. of iron. On both slopes of the mountain quantities of furnace slags are visible, indicating the former existence of iron works around this mine. Several circular holes also exist, excavated in the rock, which evidently are the sites of ancient furnaces, yet there exists in the country no written document or verbal tradition on the working of these mines. They are generally attributed in France to the industry of the Saracens, who occupied the district during the middle ages. These iron veins seem to extend in the direction of Chastel, about two miles north-west of St. Martin de Lantosque, and about 4870 ft. above the sea level, where similar ores are visible, with the addition of very rich and highly magnetic iron ores. This would give a total length of three to four miles to this formation. On the western portion of this concession a regular vein of massive galena, mixed with zinc blende, has been opened, with about 5 inches in thickness of ore enclosed in gneiss passing into mica-schist. The mean direction of this is north 65° west, with a dip of 30° towards the south. The assay of selected samples produced 69 per cent. of lead with 14 ozs. of silver to the ton of lead worked.

THE VENTILATION OF COAL MINES.

Mr. J. WILSON, viewer of the Darfield Main Colliery, delivered an able and interesting lecture on "The Ventilation of Coal Mines," on Monday, in the chapel near to the works. There was a very large attendance of viewers and stewards from some of the principal collieries in the Barnsley district, the building being full in every part. The lecture was illustrated by an excellent model of a colliery, about 8 ft. square, in which the various systems of working the coal, together with the goaves, were accurately defined, and into which gas was propelled, and the ordinary explosion from fire-damp exhibited. He also, by means of an oblong box, divided into compartments, tested various lamps, showing by experiments how a defective one ignited the gas, permeating every part, and in a colliery causing death in every direction. The chair was taken by Mr. J. MOXON, of Pontefract, one of the proprietors. The lecturer commenced by noticing the value of a good safety-lamp, and showing by experiments how in some the flame was drawn upwards to where the gas had accumulated. He said—

The only security at present in existence, if the ventilation of mines is not sufficient for working a gaseous mine, is the safety-lamp. Humane and scientific men have now for upwards of a century turned their attention to this means of security. Early in the year 1763 Mr. Spedding introduced a steel mill, by which the dangerous parts of mines were to be safely lighted by the steel, from its coming in contact with a flint, but it is needless to state that it at times brought on the very danger it was intended to avert. Several explosions from the steel mill have been recorded by Mr. Buddle, who states the first to have happened at Wallsend Colliery, on Nov. 2, 1765. For thirty years the miners were compelled when explosive gas was present either to work in the dark or by the aid of the miserable light afforded by the steel mill, after well knowing this to be exceedingly dangerous. Under these circumstances a constant reoccurrence of explosions took place. In the year 1796 Humboldt contrived a lamp that would burn safely in an explosive atmosphere, but it was never practically employed in mines. Dr. Clanny, of Sunderland, was the first scientific man in England that turned his acute mind to this subject. In 1813 he invented a lamp also, with an insulated wick, with atmospheric air through tubes, which burnt well and safely in an explosive mine. In 1815 Sir Humphry Davy had an opportunity of examining this lamp, and after a visit to Wallsend Colliery, with Mr. Buddle, in October, he sent down a lamp to Wallsend to be tested. This lamp has ever since been in use, not only in the mines of Britain, but on the Continent. The cylinder of wire is about 6 in. in height, and 1½ in. in diameter. The usual gauze has 28 wires in an inch, giving 784 apertures to the square inch. This was considered by Davy perfectly secure; it has, however, been since shown by scientific men that a lamp so constructed will pass a flame of explosive mixture moving at the rate of 5 ft. per second. Mr. George Stephenson, on Oct. 21 of the same year, at Killingworth Colliery, produced a safety-lamp which beat Upton and Roberts'. In the ventilation of coal mines, however, no subject can be of more importance to the hewer than that of an adequate supply of air to every part of the colliery in which he works. It is essential to the preservation of his health in active vigour. Respiration—the act of breathing—is a function of the utmost importance to the animal economy. It cannot be interrupted beyond a very few minutes without death ensuing. Any defect in the quantity or quality of the air is injurious to health. A healthy person inhales about 320 cubic inches per minute, consuming about 32 inches of oxygen, and discharging about 25 in. of carbonic acid gas per minute. The most important necessity for a good circulation of air in coal mines, however, probably is to render them safe from explosions of fire-damp. We will notice a few of the properties of atmospheric air, and of the gases usually given off in coal mines, so far as they affect ventilation. The weight of the atmosphere is one of the most important. It is 815 times lighter than water. At the level of the sea, with the thermometer at 60° Fahr., and the barometer at 29 8-10 in., the weight of 100 cubic inches of air is 31 grains. If we rise above the level of the sea, to the height of about 2¾ miles, the weight of 100 cubic inches is found to be half that stated, and the barometer falls to about 14¾ inches. If we descend a coal pit 1000 ft. in depth the barometer will rise about 1 in. higher than on the surface. Its weight (the atmosphere) is affected by temperature or heat; 1000 cubic inches of air at 40° heated in an upcast shaft to 60° becomes 104 cubic inches. Suppose we take a shaft 900 ft. (300 yards) deep, the mean temperature of the downcast to be 40°, and the upcast 80°; the pressure in the downcast producing the ventilation will be upwards of 71½ lbs. per square foot, and that of the upcast about 66¼ lbs.—making a ventilation pressure of 5 lbs. per square foot. The downcast temperature remaining at 40°, and the upcast being raised to 120°, increases the ventilating pressure to 10 lbs. per square foot of area of shaft. If during a summer's day the mean temperature of the downcast is increased to 60°, the ventilating pressure will be reduced 3 lbs. per square foot. Although not strictly correct, you may take it as a practical rule that with shafts 900 ft. in depth every 10° difference of temperature produces from 1 to 1¼ lb. per square foot of area of shaft difference of ventilating pressure or furnace power. We thus see the great importance of the furnaces being properly attended to, especially in hot, sultry weather. The atmosphere consists principally of two gases—about one-fifth oxygen, and four-fifths nitrogen. It is the oxygen that supports combustion and respiration, the nitrogen being simply a dilutant to reduce or modify its energy. Oxygen is a little heavier than the atmosphere, 100 cubic inches weighing 34 grains, nitrogen being a little lighter, 100 cubic inches weighing only 30 grains. Fire-damp, light carburretted hydrogen, or the bihydruret of carbon, is less than six-tenths the weight of atmospheric air, 100 cubic inches weighing only about 17 grains: this is a very important property, and very seriously affects the proper ventilation of coal mines. Pure fire-damp is not explosive until mixed with more than four times its volume or measure of atmospheric air—that is, when it forms one-fifth of the atmosphere it is explosive. This is a curious fact, and it is the reason why all the fire-damp does not explode. When mixed with more air (say, 7 or 8 parts of air to only 1 of fire-damp) it produces most violent explosions—so that we find when accumulations of it are fired in pits having a large quantity of air circulating we get the most fearful explosions. We thus see we only require 11 to 13 per cent. of fire-damp to be mixed with the air to cause the most violent blasts. Fire-damp is no longer explosive when mixed with 1 part to 15 parts of air. We thus see the large proportion of air required to render it harmless. Carbonic acid gas, black-damp, or stythe, is largely evolved in some coal mines. It is much heavier than air, 100 cubic inches weighing 47 grains. It will extinguish flame, and is very injurious to life—indeed, when pure, it is very quickly fatal. In addition to being naturally formed in coal mines, it is largely produced by explosions, and is the destructive element in after-damp, the other constituents of which are nitrogen (which is not a poisonous gas) and watery vapour. The principal gaseous elements with which we have to deal in ventilating coal mines are the atmosphere, fire-damp, and black-damp. I wish to impress strongly on your minds the great importance of duly attending to the difference of weight of these gases. I have stated the weight of each 100 cubic inches; the difference will, perhaps, be more striking if we take a cubic yard—1 cubic yard of fire-damp weighs about 7931 grains; 1 cubic yard of air, 14,463 grains; and 1 cubic yard of black-damp, about 21,928 grains. Now, the effect of this is, as we all know practically, that when there is not a sufficient current of air we find the fire-damp at the top of the roads and goaves, and the black-damp at the bottom, with water beneath the latter, if there be any. The carbonic acid is so heavy that it could be poured from one jar into another. Now, you will here observe it is exactly as much heavier than air as air is heavier than fire-damp, and it is beyond doubt or question that fire-damp finds its way to the top or roof with as much certainty and force as the black-damp finds its way to the bottom or floor. That the carbonic acid gas is really poured from one jar to another is proved by placing a lighted taper first in the jar containing air, where it will burn, and then into that containing the gas, when it will be extinguished; after which pour the gas into the other jar, and repeat the experiment with the taper or candle, when it will be found that where it burnt before it will now be extinguished, and where it was extinguished it will now burn. I will now by experiment show that precisely similar effects are produced by fire-damp, the latter rising up into the hollows, instead of flowing down into the jars. This apparatus fixed to the wall is simply three air-tight boxes, connected by an an air-tight channel at their lower ends, the whole being perfectly open at the bottom, the front being of glass, so that the effect may be seen. Now, these three enlarged parts here may represent the large and fallen goafs, and the smaller part here will represent the headings by which they are connected. Observe, I place this light in each part, and no effect follows; now I put fire-damp into the top of the middle chamber; now I put a safety-lamp into each, and you see each is charged with fire-damp; now I apply a naked light to one chamber, and an explosion results, which extends to all of them. The lesson we learn is that we find fire-damp, by reason of its own natural property of lightness, will find its way to the highest places in every mine, if allowed to take its natural course, and that in arranging our workings and air currents we should do so in such a manner that the tendency of the fire-damp and the direction of our currents should both proceed in one direction, and with one object—preventing fire-damp accumulations, and assisting its natural endeavours to attain the highest—the atmosphere outside of and above the tops of our pits. To do this our ventilation *must* ascend through our goaves, and the workmen *must not* be employed at their upper edges. This principle is too important to be passed lightly over, and the workmen should be careful to place no unnecessary impediments in the way of its being carried out.

DURATION OF OUR COAL SUPPLIES.

The probable duration of our coal supplies was the subject of consideration so far back as the time of the Stuarts; but the question seems never to have been discussed with anything like practical bearings until comparatively recently. Various contrivances for the economisation of coal resulted from the investigations and experiments of De Caus, Papin, Savery, Newcomen, and Watt. By economising the means of working, however, these expedients stimulated enterprise, and actually increased the consumption, which has been swelled, through the application of steam to locomotion and the results, to its present enormous dimensions. In the extraordinary development of commercial enterprise following and encouraging the establishment of railways, the rich coal resources of the country were treated as inexhaustible. The machinery of commerce was to be supplied; and the supplies for the insatiable present were obtained without thought for the wants of the future. This state of things, however, could not last. Far from "the haunts of busy men," the man of science and the statist had been examining the position of affairs. In the midst of lavish expenditure and positive waste we were brought up by the startling information that our coal resources could not hold out very much longer. In Parliament and out of Parliament the question of the coal supply has been considered. Scientific men like Sir William Armstrong, philosophers like Mr. Mill, and statesmen like Mr. Gladstone have entertained it at one time or other during the past few years; and at length the manufacturer—whose interest is most immediately associated with it—is taking it up in a practical way.

The probable duration of coal is, of course, of the first importance to the North of England. Containing within it limits somewhere about a tenth of the entire workable coal of the country, it is now producing about a fourth of the British coal supply. Though the returns for last year show a small decrease on those of 1866, there is a little reason to doubt that the production of coal from the northern coal field will go on increasing, though possibly limits may be attained to the ratio of increase, by which Mr. Jevons contends it has been and will in future be developed. The northern coal supply is a question of national importance; and when we remember that the prosperity of the North of England iron trade so largely depends upon the readily accessible production of the northern coal field, we easily see that its local significance is of still greater moment. Various estimates as to the duration of the northern coal field have been made at different periods. In 1829 the late Mr. Hugh Taylor, for many years Chairman of the Northern Coal Trade, giving evidence before a select committee of the House of Lords, and basing his calculations upon the consumption of coal at 3,500,000 tons per annum, estimated the term of duration of the northern coal field at 1727 years. In 1846, Mr. Greenwell, taking the consumption at the rate of upwards of 10,000,000 of tons per annum, stated that "the northern coal field would continue 331 years." Mr. T. Y. Hall, in 1854, taking the annual consumption at 14,000,000 of tons, including the small coal as unsaleable, gave 365 years as the period for the duration of the northern coal. Mr. Hall assumed that the consumption was not unlikely before the lapse of many years to reach not less than 20,000,000 of tons annually. At this rate he calculated the northern coal field would be exhausted in the course of 256 years. Referring to Mr. Hall's calculations, which appear to be concurred in by Mr. Fordyce, in his "History of Coal, Coke, and Coal Fields," Mr. Hull says: "For myself, I am ready to accept results which have been arrived at on independent grounds by persons so well acquainted with the district as the authors above named. My own calculations of the resources and length of time necessary for their exhaustion is somewhat greater, arising principally from a smaller deduction for waste and loss than that assumed by Mr. Hall." Taking the rate of consumption in 1857 at about 15,900,000 tons, Mr. Hull estimated the duration of the northern coal supply at 466 years. Sir William Armstrong, in his presidental address to the British Association, at their meeting in Newcastle in 1863, assuming—as appears to be granted by all authorities—4000 feet as the greatest depth at which "it will ever be possible to carry on mining operations," said:—"So far as this particular district (the district of the northern coal field) is concerned, it is generally admitted that 200 years will be sufficient to exhaust the principal seams, even at the present rate of working. If the production should continue to increase as it is now doing, the duration of those seams will not reach half that period."

As we have already remarked, the duration of the northern coal supply is chiefly important to the North of England iron trade. The coal produce of other districts, which at present promise to hold out longer than Northumberland and Durham, may keep off the evil day for other industries; the northern iron trade, it is deemed by competent authorities, can reply upon no such alternative. In a paper on "The Economical Manufacture of Iron," read before the British Association at Norwich a few weeks ago, Mr. Jones, secretary of the North of England Iron Trade, said:—"The supremacy of the British iron trade depends upon the comparative abundance of fuel in close proximity to the ironstone; and in proportion as the mineral treasures of coal and ironstone are exhausted, so will the position of this national industry decline, for the importation of the raw material is quite out of the question." Hence the attention of the iron trade has been directed to the important question of the economisation of fuel. The significance of the question will at once be seen when we consider that the iron manufacture of the country alone nearly consumes about 15,000,000 tons of coal, or, as Mr. Jones puts it, "rather more than a seventh of the total quantity raised from the various coal fields."

Mr. Jevons, in a paper read before the Literary and Philosophical Society of Newcastle, the other day—see *Mining Journal*, Oct. 24—expressed an opinion that the rate of consumption of coal will increase by geometrical progression; and he believes that whatever means may be applied for the economisation of fuel can only have the effect of increasing the consumption. There are many reasons why Mr. Jevons' calculations should be approximately correct, and perhaps there are as many why they should be wide of the mark. On the one hand, it is clear that our coal supplies are rapidly approaching exhaustion; on the other, it is evident that many means of economising coal, and even of supplanting it as an article of fuel, are possible. It is quite true that the manufacturer must not sink into a commercial Micawber, trusting to the chance of something "turning up," to recruit his waning resources; yet there is no reason why he should not be sanguine that an age already so prolific in scientific discoveries and mechanical inventions may have in store for him the precise remedy for his peculiar complaint. We use thirty times more coal by means of steam than we would use if we possessed a perfect heating apparatus. Already furnaces like those of Siemens and Wilson are affecting a considerable saving in this direction; and we see no reason why the perfecting of mechanical applications should not save still more, even to the extent of the 3,000,000 of tons—about a fifth of the present consumption of coal in connection with the iron trade—deemed possible by Mr. Jones. A project also for the purification of fuel has been spoken of, which if properly carried out could scarcely fail to exercise an important influence on the economical manufacture of iron. Setting aside the economisation of existing fuel, there is no reason why the dynamical theory of heat should not lead to the application of a new caloric agent—from water, for instance. Stirling, Siemens, and Ericsson have already dealt with caloric; and scientific men, like Mr. Groves, have strong faith that the inventive powers of mankind can meet the anticipated deficiency of fuel.

To return to the immediate prospects of the northern coal and iron trades, we are by no means inclined to endorse the gloomy views which have obtained and now obtain about them. We have probably hitherto relied too much upon the extent of our present coal supplies, without reference to the future; and timely economy may do much to lessen the ratio of consumption. We cannot think, with Mr. Jones, that "the importation of the raw material is quite out of the question," at least so far as coal is concerned; and the coal fields of the world, Sir William Armstrong tells us, are practically inexhaustible. Our iron manufacturers can scarcely be placed in a worse position, as regards the supply of coal, than the rest of Europe. In the meantime—while economy is practised by every possible means and while scientific investigation holds forth at least colourable hopes of the discovery and application of new caloric agencies—we may regard the declension of our commercial and manufacturing supremacy as a contingency too remote to be considered at present.—*Daily News.*

MODERN ENGINES.—The sixth part of Mr. BOURNE'S "Examples of Modern Steam, Air, and Gas Engines, of the most recent types," &c., contains large plates of the slide and expansion valve-gear and boilers of the Royal Mail steamer Russia; and diagrams of Reynolds' water-jet pump, and of the various new steam fire-engines which have proved efficient in use. There are also engravings of Andrews' centrifugal pumps, and of the centifugal pump and machinery used for draining the Stadil Fjord, on the coast of Jutland.

"SCIENTIFIC OPINION."—Whatever favourable anticipations may have been formed from a consideration of the judgment and ability of those entrusted with the management of the recently-announced *Scientific Opinion*, the first number, which was issued on Wednesday, is not likely to disappoint them. The number consists of sixteen closely-printed pages, and so varied are the subjects treated of that the reader cannot fail to find much to interest him, whatever branch of science may form his especial study. Physics, astronomy, photography, botany, chemistry, entomolgy, and various other arts and sciences find a place in its pages, in addition to which there is a good summary of the proceedings of scientific societies, as well as reviews, correspondence, and notes, queries, and memoranda—so that the periodical can scarcely fail to become a general favourite in every household wherein the reading of the more substantial class of literature is encouraged.

GEOLOGICAL MAGAZINE.—The November number of this magazine contains a highly interesting article by the editor, "On a Newly Discovered Long-eyed Calymene, from the Wenlock Limestone, Dudley," illustrated with a beautifully executed plate, showing the calymene ceratophthalma figured the natural size, and the asaphi, &c., referred to in the paper. The Rev. O. Fisher contributes a paper "On the Elevation of Mountain Chains, with a Speculation on the Cause of Volcanic Action," which contains a large amount of information; and there are also original papers by Mr. T. P. Barkas, "On Climaxodus, or Poecilodus; a Palatal Tooth from the Low Main Coal Shale, Northumberland;" by Mr. J. Logan Lobley, "On the Range and Distribution of the Fossil Brachiopoda;" and by Capt. F. W. Hutton, "On the Classification of Rocks." The memoirs noticed are those of Mr. Delaunay, read before the Academy of Sciences, Paris, "On the Hypothesis of the Internal Fluidity of the Terrestrial Globe;" and of Mr. N. S. Shaler, "On the Formation of Mountain Chains." "Cordier's

Description of Rocks Comprising the Earth's Crust," by Mr. C. D'Orbigny; several works on "Recent and Fossil Entomostraca;" and Dr. Bigsby's "Thesaurus Siluricus," are ably reviewed, and the correspondence is of an unusually interesting character, so that, upon the whole, the number is the best that has appeared for some time.

FOREIGN MINES.

ST. JOHN DEL REY MINING COMPANY (Limited).—Advices received November 3, per steamer Oneida, *via* Southampton.

Morro Velho, Sept. 29.—GENERAL OPERATIONS.—We have been very much impeded during the last fortnight in our general work by the continued diminished supply of water available for working the hauling, pumping, and reduction machinery. By measurement, made on the 23d current, the quantity coming on the establishment from all sources was as follows :—

By the Cristaes watercourse............	1145	cubic feet per minute.	
By the Garden ditto	422	,,	,,
By the Criminoso and Bananal ditto ..	80	,,	,,
By the Routh Arrastres ditto	24	,,	,,
Total	1671	cubic feet per minute.	

The above is the smallest supply of water we have had for a period of ten years past. The upper watercourses are now bringing in much less than in 1860, which was one of the most trying seasons as regards small water supply.

MINES.—Excepting on one or two holidays we have had a very good attendance of natives in the mine department, quite sufficient for our stoping space. The quarrying has been continued with regularity at the respective places being worked, excepting at the East Cachoeira section, where, from the failure of a portion of the south wall, we have felt it necessary to withdraw the borers from working in that section.

In the GAMBA MINE the sinking and stoping are going on steadily, and we are at present getting a fair supply of stone therefrom, affording about the usual proportion of mineral for the stamps.

In the BAHU, at Nos. 3 and 4 stulls, our stoping is giving about the same quantity of stone as heretofore, but the quality is not so good.

In the EAST AND WEST QUEBRA PANELLA SECTIONS we have had a full force employed, and an adequate amount of stone raised. The quality has been poor, giving a very small proportion of ore on the floors.

The pumping is still gaining a little in lowering the water in the Bahu, and the general work in the department has been carried on steadily.

GAIA MINE.—For a few days we were short of hands to give a good supply of mineral for the stamps, otherwise the stoping has been carried on with vigour, and fair duty has been done. At Servico Novo a small quantity of mineral has been raised from the lode in the old workings, and is now being tried in the stamps during the last division of the month. The tramway and shaft for spalling-floor are well forward towards completion.

REDUCTION DEPARTMENT.—The exceedingly low supply of water is much felt at present in this department, as many as 16 stamp heads have been suspended for want of water to drive the whole, and we are now suffering still more in proportion from deficiency of water at the arrastres, a very considerable proportion of which have been thrown out of work from the same cause. The spalling is being done finer, and the largest number of heads practicable is being kept regularly at work. The amalgamation machinery has worked effectively and well during the past fortnight.

PRAIA WORKS.—Both the stamps and arrastres at these works are now being driven much slower than is desirable, owing to the diminished and very inadequate supply of water. The sand received from Morro Velho is poor, and also the killas available for its re-treatment in the stamps, so that we cannot expect anything approaching average produce here under present circumstances.

GOLD EXTRACTED TO DATE.—The produce from the stamps for the second division of September, being a period of 11 days, amounts to 3007 oits. It has been derived as follows :—

	Oitavas.		Tons		Oits. p. ton
General stamps	1,847	...... from	1331·6	=	1·387
Herring ditto, Gamba ore	1160	...... ,,	406·2	=	2·855
Total	3,007		1737·8		1·730

GAIA MINE.—Gaia and Gabiroba ore, 598 oits. from 278 tons stone=2·151 oits. per ton. The above shows an improved gold return in the general mineral as compared with previous division, the whole produce from the stamps giving half an oitava per ton higher yield. The improvement is principally attributable to the better return from the Gamba mineral.

The Gaia gold return continues pretty uniformly about the same yield from the mineral treated. The health of the establishment continues good.

The GOLD TROOP left on September 26 for Rio de Janeiro, taking 5 boxes of bar gold, containing 14 bars, and weighing in all 20,048·1 oits.=192·601 lbs. troy. From the low rate of exchange prevailing, the remittance will be shipped to England as heretofore, and the agents at Rio have been requested to have this done on the arrival of the gold there.

N.B.—The gold has arrived in London, and has been delivered at the Bank of England.

Morro Velho, Oct. 3—PROPOSED SHAFTS.—It gives me pleasure to inform you that during this week we have had three special mine conferences, for the purpose of considering the plans proposed by Mr. Sopwith for re-opening the mines, and that at the meeting, held yesterday, we concluded the discussion and consideration of the several points embraced in the position, form, and size of the proposed shafts. The most eastern shaft, that which is to be permanently the sump-shaft, is to be sunk at a point to cut the lode at the eastern limit of the West Cachoeira section, coming at that horizon within the limits of the walls of the lode. This shaft has so far been called A. The second, B, or the permanent hauling shaft, to be about 6 or 7 fathoms south-west from A, and at least 5 fathoms south clear of the lode. The shafts are to be constructed round, A to be 12 feet, and B 13 feet in diameter. The discussion of the various points has been carried on with deliberation and interest, and the conclusions arrived at may be regarded as almost unanimous in every respect. On Monday levelling for shaft A will be commenced, and we shall very soon, I hope, be earnestly at work in sinking. My attention has necessarily been very much engaged in the consideration of the details likely to arise in these questions, and in aiding to clear away the difficulties in the way of the proposed plans being fairly considered for adoption. So far this duty has been accomplished most satisfactorily, and I trust we shall be able to continue to have the best plans adopted, being those most suitable for our actual circumstances.

DON PEDRO NORTH DEL REY.—Mr. F. S. Symons reports—Produce, weighed to date, amounts to 20,071 oits.; estimated produce for September, about 21,000 oits.; remittance, 34,668 oits.; value, about 14,734*l*. The operations have been carried on with the usual regularity, and the general body of lode has yielded splendidly. Some box work has been taken out from No. 5, both easterly and westerly. This fine body of lode maintains its size and auriferous quality.

ANGLO-BRAZILIAN.—Mr. F. S. Symons reports—Remittance, 7543 oits.; value, about 3394*l*. This exceeds the last by 707 oits., and that sent forward in May by 1249 oits. The works generally have progressed steadily, but the attendance of natives not having improved since my last, only fair duty has been done in the mine. The lodes, however, maintain very favourable features, particularly that in Dawson's shaft, and to the 20th 2221 oits. of gold were obtained, from 841 tons of stone.

ROSSA GRANDE.—Mr. Hilcke reports—Remittance, 2491 oitavas; value about 1059*l*. Little alteration has taken place in the appearance of the lode since my last; that in the level is again of a larger size, and the lode in the shaft is of a more disordered nature. The great decrease of the gold percentage in the lode at these points, and mainly in the stopes above the level, where our main supply of stone is derived from, is again, I am happy to say, since the last few days, rapidly improving, and has recovered its former good quality, therefore, the produce for the last 10 days is more encouraging, and by far better than in the beginning of the month.

SAO VICENTE.—The directors have advices from the company's superintendent in Brazil, in which the fact that gold has been cut in the jacotinga formation is communicated :—"Our force during the month has been inadequate to our requirements; I hope, however, in another month's time this evil will be remedied. We have had to stop the stamps a great many times, owing to the irregularity in the attendance of the workpeople at the spalling-floors. Our works, considering the force during the month, have progressed very favourably, and many thanks are due to my officers and men for the energetic manner in which they have done their duty.—Mine: The lode at No. 2 level west promises to turn out well; at one place its width has increased to about 7½ feet. We have an extent of about 10 fathoms on the lode, and the average width is about 4½ feet, and apparently increasing. We have put four pairs of borers at this point to work day and night, and I hope to be able, with what we have already at surface, to supply the stamps the greater part of the month with stone freed from killas, in order to ascertain its value. At the crush we have uncovered the lode, and hauled from 30 to 40 tons of it to surface; this stone will be treated jointly with the stone raised from No. 2 level west. Our force not being sufficiently strong to man the crush and the No. 2 level west, and the latter being the most promising, I have removed the men to that point.—Eastern Section: Our progress at this point has been slow, owing to want of force. The lode is improving both in size and appearance. Next week I hope to commence to haul some stuff from this point.—Jacotinga Formation, Cross-Cut: During the night of the 17th some stuff fell from the back of the level, which for some days completely retarded our progress in extending the level; this has been removed, and the level throughout properly secured with sets of first-class timber: 5 fms. of ground have been driven, of which 3 fathoms have been through jacotinga. On the 26th we cut a line in the bottom of the level, and one, though only one, sample showed rough gold; this, however, promises better days. I purpose continuing this level on its present course till we get to the north wall, in order to ascertain the size of the bed of jacotinga, and also in the hope of finding a larger line. Our carpenter is now making a "canoa," in which to pass the stuff that may come from the line or lines. The entrance of the level on the eastern side of the mountain has been secured with 10 sets of first-quality timber, but beyond this, owing to want of labourers, nothing has been done. A party of good workmen have come in to-day, and will commence operations to-morrow. Produce extracted from about 90 tons of killas during the month is 23 oitavas of gold."

RHENISH CONSOLS.—G. Sweet, Oct. 29: Christiana: The driving east in the 20 lachter level will afford 2 tons of lead ore per lachter, and the end is still letting out a great quantity of water. The western end, is this level, is poor, and we have discontinued its driving for the time, and put the men to stope the roof of this level. The driving west, in the 10 lachter level, will afford 12 centners of lead ore per lachter for the part of the lode carrying—about 3 ft. As there is, we believe, a great width of lode still standing to the north of this end, we have commenced to cross-cut to the north wall. In the cross-cut small veins of lead are running in various directions. A stope in the roof of the 20 lachter level, and west of cross-cut, will afford 1½ ton of lead ore per lachter. A stope in the roof of this level, and east of Pittar's winze, will afford 2 tons of lead ore per lachter. A stope to the west of this winze will afford 1½ ton of lead ore per lachter. A stope in the roof of the adit level, and west of Sweet's winze, will afford 1¼ ton of lead ore per lachter. A stope in the bottom of this level will afford 1 ton of lead ore per lachter.—Bliebach: In the driving west from the cross-cut, on the middle lode, in the 10 lachter level, the lode is improved, and will now afford 1 ton of lead ore per lachter; the end is being driven by six men. The lode in the adit level, and in the western breast of the ancient workings, alluded to in former reports, will afford 16 centners of lead ore per lachter. We are putting in a cross-cut to the middle lode, from the bottom of the air-shaft, and expect to reach the lode in a week from the present date. A stope in the roof of the 10 lachter level, on the middle lode, will afford 1 ton of lead ore per lachter. Nos. 1 and 2 stopes, in the roof of the adit level, on this lode, will afford 1 ton of lead ore per lachter. A stope in the roof of the 10 lachter level, on the north lode, will afford 15 centners of lead ore per lachter. A stope in the bottom of the adit level, on this lode, will afford 15 centners of lead ore per lachter. A stope in the roof of the 10 lachter level, on the south lode, will afford 1½ ton of blende per lachter. From the productiveness of the middle lode in the adit level, and the improvement in the driving on this lode in the 10, we consider the appearance of Bliebach to be greatly improved.—Madonna: The driving from the shaft has been extended west about 4 lachters, the present end being under an old level, from the bottom of which some fine stones of lead ore have fallen down, and we hope to reach the lode shortly. Estimated returns for October month :—Bliebach and Christiana: Lead ores, 600 centners, 1700 thalers; blende, 120 centners, 120; Fahrenberg lead ores, 20 centners, 60=1880 thalers.—Estimated cost on Mines: Bliebach and Christiana, 1900 thalers; Fahrenberg, 45=1945: leaving, 65 thalers; sinking Astley shaft, 300 thalers: making a total of 365 thalers. This last week there has been plenty of rain, which has afforded a full supply of water for Christiana wheel; consequently, the consumption of coal will be greatly lessened.

FORTUNA.—Oct. 24: Canada Incosa Mine: The 110, east of O'Shea's shaft, yields 1 ton of ore per fathom; the lode, although not so good as it was, continues very kindly. No change has taken place in the 100, west of O'Shea's shaft. The lode in the 90, west of Judd's shaft, is compact and regular, and yields 2 tons of ore per fathom. In the 80 cross-cut south the ground is hard, and progress is, consequently, slow. The 70, east of Carro's shaft, produces ½ ton of ore per fathom; the lode is much broken up, and lets out plenty of water.—Shafts and Winzes: We hope to get Henty's shaft down to the 100 this month: The lode in Lowndes' shaft, below the 70, is large, composed of sulphate of lime, and contains spots of lead ore. Diaz' winze, below the 55, yields ¾ ton of ore per fathom; the ground is more favourable for sinking; the lode is split into two parts. Picon's winze, below the 90, yields 1 ton per fathom; good progress is being made in this winze.—South Lode. The lode in the 50, east of San Pedro shaft, is large, composed of carbonate of lime and lead ore, yielding of the latter 1 ton per fathom. Cassada's winze, below the 45, produces 1½ ton of ore per fathom; the lode is regular and compact, and has a very good appearance.—Los Salidos Mine: The 100, west of Morris's engine-shaft, yields 1 ton of ore per fathom; the lode is large and kindly, composed of granite, calcareous spar, and lead ore. In the 100, east of Morris's engine-shaft, the lode is disarranged at present by a strong cross-joint. The 90, east of Cox's shaft, contains small strings of lead. The 75, east of San Pablo's shaft, yields ½ ton of ore per fathom; the lode is small, and the ground hard for driving.—Shafts and Winzes: Buenos Amigos shaft, sinking below the 90, yields ¾ ton of ore per fathom. San Gabriel shaft, below the 90, produces ½ ton of ore per fathom; the lode is not so rich as it has been, and the ground is wet and troublesome for sinking. Corzo's winze, below the 90, also yields ½ ton of ore per fathom; this shaft will reach the required depth for the 100 in another week. The lode in Ramon's winze, below the 75, is regular and compact, producing 1 ton of ore per fathom. Tomas' winze, below the 65, yields 1½ ton of ore per fathom; the lode is strong and kindly, composed of carbonate of lime and lead ore. Prim's winze, below the 90, produces 1½ ton of ore per fathom. This new winze is situated east of San Gabriel shaft, and in advance of the 100; the lode is compact and solid, and the ground is easy for sinking.

ALAMILLOS.—Oct. 26: In the 4th level, east from Magdalena shaft, the lode has become smaller, and less productive. The 5th level, east of above shaft, produces 2 tons of ore per fm. The 5th level, west of Magdalena shaft, is also worth 2 tons per fathom. The lode in the 5th level, east of Taylor's engine-shaft, has improved, and is now worth 1¼ ton of ore per fathom. The ground in the 5th level, west of above shaft, is hard, and the lode is small. In the 4th level, west of San Andriano shaft, the lode is cut, but is unproductive. The driving of the 3d level, west of San Yago shaft, is resumed; the lode yields good stones of lead ore. In the 2d level, east of Judd's shaft, the lode is very small, and valueless; and the lode in the 2d level, west of Judd's, is of the same description. In the 3d level, east of Crosby's engine-shaft, the lode is disarranged, and poor. The 3d level, west of Perez' winze, produces 1 ton of ore per fathom. The lode in the 2d level, west of Morris's shaft, is very irregular, and is at present poor.—Shafts and Winzes: In sinking San Enrique shaft below the 3d level good progress is being made. No change has taken place in the appearance of Taylor's engine-shaft below the 5th level. Henty's shaft, below the 1st level, yields 2½ tons of ore per fathom. We have cut water in the bottom of the shaft, and are now preparing to drive east and west on the course of the lode. The lode in Tomas' winze, below the 4th level, has slightly improved, now yielding 1 ton of ore per fm. Angados winze, below the 4th level, produces 1½ ton of ore per fathom; this is being sunk in advance of the 5th level, east from Taylor's shaft. The lode in Juan's winze, below the 3d level, is small; the ground is easy for sinking.

LINARES.—Oct. 24: West of Engine-Shaft: The lode in the 110, driving west of San Tomas engine-shaft, is small, yielding a little lead, but not enough to estimate. In the 85, west of Warne's engine-shaft, the lode, which is large and strong, and letting out a quantity of water, produces ½ ton of ore per fathom. The 85, east of Warne's engine-shaft, is wet, and difficult to drive. The 45, east of No. 159 winze, yields 1½ ton per fathom; the lode is very firm and compact, containing a good branch of lead. The lode in the 31, east of San Francisco shaft, is very regular, consisting of quartz and lead ore, yielding of the latter 1½ ton per fathom.—East of Engine-shaft: The lode in the 95, east of Taylor's cross-cut, is large, yielding occasionally stones of ore. In the 95, east of Taylor's shaft, the lode, which yields ¾ ton of ore per fathom, has improved during the past week, and is looking more kindly than it has for some time.—Winzes: No. 162 winze, below the 31, is going down in a kindly lode, worth 1 ton per fathom. No. 163 winze, below the 85, yields ¾ ton of ore per fathom; the lode is small, consisting chiefly of carbonate of lime and lead ore.

[For remainder of Foreign Mines, see this day's Journal.]

AUSTRALIAN MINES.

YUDANAMUTANA COPPER.—The directors have advices from the superintendent, dated Adelaide, Sept. 10, who states, in reference to the telegram: —*Telegram from Galle.*—Mine to you, dated June 10, in which no mention is made of any discovery, will have convinced you that the telegram you received never emanated from me, and was, therefore, *a hoax*; but at the date of the said telegram having been handed in Galle (July 14), it is remarkably coincident that a valuable discovery was made at Blinman, in the winze at the 10 (see my description of it in my visiting report, dated July 20, under the head of important discovery). If the telegram you received had been sent from here to Galle it must have left here by the June mail, at which date even this discovery had not been made. I have instituted enquiries here, and I find that no such telegram passed through the Adelaide offices. My conclusion is that it must have been sent to Galle from London, to be returned for the purposes of stock jobbing. My disappointments are many, and generally most unexpected. This past week I relied upon not less than 14 tons of metal, and I hear of only 8 tons made, in consequence of dry wood ceasing to come in (through many of the non-contract cutters having left for the Queensland diggings), and by reason of Nos. 2 and 3 being out for repairs again. No. 5, however, has been completed, and, after three weeks careful firing, will have the first charge dropped in on Monday next, the 14th inst.; this I hope will assist in putting matters right, and will enable me to make a satisfactory show by our annual audit (to end of November next). My every thought is directed to the company's interests, and if the board will bear with me for a short time in my difficulties, I am certain that the future of the Blinman will more than compensate for the anxieties of the past. By the July mail I forwarded 1000*l*., and by this mail have the pleasure to inclose first of exchange for a similar amount (1000*l*.) Your board will be aware that it was not until September, 1867, that we began to make a move, since which time with copper at a fearfully low price throughout, we have paid on your account 9000*l*., and remitted with the present draft other 3000*l*., in all 12,000*l*., besides meeting cost of valuable permanent works, and further development of the mine. I leave to-morrow for the mine, and if down in time will forward report of inspection next mail. The Government have done me the honour of investing me with the Commission of the Peace. This appointment will serve the interests of the company, now that the Blinman Local Court is established. I shall take my seat at the full Court while I am at Blinman this trip.

Capt. Tyrrell (Sept. 5)—I am pleased to inform you that all the places mentioned in my last report are continuing to look well, and the lode in bottom of the No. 1 winze greatly improving; I never saw a more splendid lode. The mine altogether is in a very prosperous condition. My return of copper for the month is 43 tons made: dispatched to Port Augusta, 43 tons 2 qrs. This, I am glad to say, is an increase on several months past; and now that we have Nos. 4 and 5 furnaces completed, I shall be able to keep three, and often four, furnaces in full work. There is abundance of first-class ore to keep them well supplied. Ore raised in the month 345 tons, the whole of this has been smelted. Slags assayed from 1 to 1½ per cent. Wood and charcoal coming in plentifully, and everything going on with great satisfaction. To all appearance, this will be a good season; at the present time we are having nice showers. Fire-bricks are still being made and burnt on the mine, which are of superior quality. In conclusion, there is every probability of prosperity.

WORTHING.—Adelaide, Sept. 12: Legg's engine-shaft is sinking favourably; ground sunk (to Aug. 21) in the month is 8 ft. 3 in. The men have had rather a hard bar of ground this month, but the ground coming in is improving, the strings of ore, &c., are increasing, and a great deal of water is coming from the east, no doubt from Boundy's lode. The 83 north end continues to improve, both for driving and also for ore. The lode is about 3 ft. wide, and will yield from 2 to 3 tons of ore to the fathom; present price for driving 10*l*. per fathom; ground driven last month is 13 feet 2 in. The 83 south end is still very hard, but not without ore; present price for driving 40*l*. per fathom. This I hope will not last long, but if we wish to get to the easy ground we must drive the hard. In the 63 south end, we have been for a long time at a loss, as to the right course of the lode, but by holing into No. 3 winze from Harding's stopes, we have let down the water to the bottom of the winze, and discovered a part of the lode going off to the east, so that we have now turned the end to drive a little more to the east, where we hope to meet with the part of the lode gone off in the winze above; price for driving 18*l*. per fathom. All the stopes are about as usual for ore. I am in hopes that in the 73 stope we are at the back of the hard bar that we met with in the 73 south end. We have been stoping from the back of the 73 so far south as the hard bar, and now it appears as if we have got to the top and back of it, as the soft lode appears to be deepening down behind it, and making a real good lode of ore. Should this continue it is every way likely the south will again open out and render great assistance in our returns. Quantity of ore raised (August month), 190 tons; copper waiting shipment, 23¾ tons; number of hands employed, 124.

ENGLISH AND AUSTRALIAN COPPER.—Sept. 14: The quantity of coals at Kooringa was 285 tons; Kapunda, 69 tons; and at the port and afloat about 1109 tons. There were three furnaces at work at Kooringa, and four furnaces and one refinery at the Port Works. Since date of last advices the 200 tons of copper mentioned therein as in course of shipment have been shipped, and a further shipment of 200 tons was being made at date of advices.

PORT PHILLIP AND COLONIAL GOLD.—Mr. Bland, Clunes, Sept. 11: The quantity of quartz crushed during the four weeks of August was 5167 tons, yielding 2353 ozs. 10 dwts. of gold, or an average of 9 dwts. 3 grains per ton. The receipts for the same period were 8706*l*. 10s. 9d.; payments, 4653*l*. 13s. 11d; profit, 4052*l*. 16s. 10d.: added to which was last month's balance of 184*l*. 17s. 11d., which left an available balance of 4237*l*. 14s. 9d. The amount divided between the two companies was 4000*l*., the Port Phillip Company's proportion being 2600*l*. The balance of 237*l*. 14s. 9d. was carried forward to next month's account. The return for the first three weeks of September is as follows :—Quartz crushed, 3874 tons; total gold obtained, 2048 ozs. 8 dwts., or an average of 10 dwts. 13 grains per ton. Remittances, 2559*l*. 11s. 5d.

YORKE PENINSULA.—The directors have received advices from the committee of inspection of the company at Adelaide, dated Sept. 12, with reports from the Kurilla Mine to the 10th of that month. Capt. Anthony states that the back of the 35, east of Hall's shaft, is being stoped by four men, and producing 2 tons of 15 per cent. ore to the fathom. The 35 east is being driven by six men, and yielding sufficient ore to pay the cost of driving. Tributers are continuing to stope the back of the 25 at 10s. in the pound. The following are extracts from Capt. Anthony's report :—"I would remark that there is a great improvement in the 35 east over the 25 directly above, allowing for the westerly dip of the spar, both in the lode and in the stratum. I sent to the smelting works, on August 24, the following parcels of ore, gross weight—roughs 22 tons, giving by my assay 17¾ per cent.; and of smalls 10 tons, agreed to be taken by the smelting company, at 13 per cent. I have on the floors about 20 tons of ore. The engine and pitwork are working satisfactorily. I would remind you of the gradual improvement taking place in this mine, and again urge the necessity of sinking the shaft immediately. I regret that the price of copper is so low, but it is a fitting time to carry on dead work, so as to be prepared for raising ore when it will command a higher price." The chairman of the committee, the Hon. Thomas Elder, had visited the mine, and, aided by the advice of Capt. Dunstan, of the Wallaroo Mines, had discussed with Capt. Anthony the subject of sinking Hall's or engine-shaft from the 35 to the 45; and this having been again very strongly recommended, the committee had ordered it at once to be commenced, and to be completed with the least possible delay. The committee have not found it necessary to draw by this or the preceding mails, the produce of ore raised from the mine having been sufficient to enable them to carry on operations without drawing further funds from London."

SCOTTISH AUSTRALIAN.—The directors have received advice from Sydney, dated Sept. 9, with report from Lambton Colliery to the 8th of month. The sales of coal for the month of August amounted to 13,092 tons. A reduction had been made in the price of coal. This had been followed by greatly increased activity in the coal trade, and it was expected that the sales of Lambton coal for the month of September would exhibit a considerable increase.

AUSTRALIAN UNITED GOLD.—The directors have received advices from Mr. Kitto to Sept. 10. Mr. Kitto writes :—"Duke of Cornwall Mine: The works progressing rapidly, as you will perceive by the remarks made below. —Engine-Shaft (Sharpe's): The ground in this shaft has been very hard, but is now improving; we have reached a depth of 50 feet.—Dauke's Shaft: This has been sunk a distance of 90 feet; ground hard.—Old Shaft: The little engine having been put into thorough repair has, with the aid of horse-power, drained this shaft, and I intend driving a cross-cut to intersect the lode at the bottom level.—Engine House: This building is nearly completed. A better piece of work, I think, cannot be found in any mining district in the world. If the new engine were here I could have it at work in two months from this time. I am sadly afraid I shall be unable to go much deeper without it. The boiler is being put together, so that I hope to have it fitted before the engine arrives.—Reservoir: I have completed the construction of this work, and am driving a lobby from it to the engine-house, a distance of about 100 yards, with a view to supplying the stamping machinery with water. I was most fortunate in the weather, and had the reservoir fininished in time to collect the spring rains. The whole cost of my water works will not exceed 300*l*. (lobby included). When the stampers are erected I shall have an ample supply of water.—Offices and other Buildings: The offices, store-rooms, smithy, and carpenters' shop are finished, and all other necessary works are being carried on as rapidly as possible."

AUSTRALIAN MINERAL PRODUCTS—TUBE WELLS.—A correspondent of the *Times*, writing from Sydney (Sept. 8), says he was much interested at a local Agricultural Show in a display of colonial minerals—mainly the products of the north-west. There were specimens of coal from all the 11 working seams, two of which, it will gratify geologists to know, are below the equivalent of the mountain limestone—the "farewell rock" of the English coal miner. I saw splendid specimens of amethyst crystals from the Wingen Mountain; lime from below the coal seam at Maitland, evidently organic; white sulphur from Wingen Mountain, prettily veined black marble from the Williams River, limestone strongly impregnated with iron from Stroud, crystals of lime from Singleton, alum from Berrina, oil shale from Wollongong, turpentine from Carooray, malachite from Peak Downs of surprisingly rich lustre, pea iron ore from Bungonia, meerschaum from the Richmond, and cinnebar, a recently-discovered treasure, which is found in large quantities at Cudgegong. A specimen from the Calliope gold fields displayed gold upon limestone, clearly indicating the age of the gold deposit.

There was another exhibit among the implements which demands notice. I refer to a TUBE WELL, exhibited by Mr. Keene, the Inspector of Mines, which seems to be the *fac-simile* of the well which he sunk 28 years ago at Briscous, near Biarritz, in search of the brine spring which he suspected to exist there. That well was sunk to a depth of 140 ft., and is still in operation. Its superiority to the ordinary tube well is unquestionable. It may be sunk through the solid rock, and, admitting of a force-pump, water may be raised from any reasonable depth, while the well, now notorious as the "Abyssinian," fitted only with a suction-pump, cannot raise water which is beyond 28 ft. of the surface. The tube to be sunk is not shot with a steel point, and pierced with holes; it is quite open at bottom, and possesses a free-cutting circumference in contact with the ground. It is driven by a monkey, worked by means of a simple frame placed over the bore. If rock is encountered, a jumper is used inside this first tube, the pulley and rope of the monkey frame being used to pull it up and let it fall. This jumper having pretty free motion within the tube makes a way of larger circumference than the tube, which is easily driven down to occupy the position thus secured for it. The jumpers are adapted to the rock they have to penetrate. For quitting the rubbish made by the jumper a tubular jumper is used, which, when filled with material, is withdrawn and emptied. As the bore deepens tube is added to tube until water is reached. When this feat is accomplished a second tube is inserted with the plunger and valves of a pump at the bottom, and is lowered, together with a rod reaching to the surface, the latter being then worked by the usual lever. The well complete, with monkey frame, &c., as I saw it, and fitted for 40 ft. descent, was offered for 15*l*.

DISCOVERY OF A GOLD FIELD IN SOUTH AUSTRALIA.—For long years South Australia has coveted a native Bendigo, but hitherto with more disappointment than success. She has made many discoveries, from Cape Jervis to Echunga, and from the Barrier Ranges to the Bremer. She has "rushed" embryo diggings, and promoted gold companies, but without ever realising large nuggets or good dividends. Still, she has refused to lose faith in her auriferous destiny, and at length her patience has been rewarded. Jupiter Creek is a *bona fide* gold field, and there is plenty of it, if the precious metal should only happen to be equally diffused. So far appearances are very much in its favour, and its prospects have been brightening from the first week of its history. There has been nothing as yet that may be called a rush, in the Victorian sense, but a gold field which can attract a population of about a thousand within a month is at least a useful addition to our native industries. The discovery could not have come more opportunely than it did—in the middle of as dull a season as has ever been experienced, and on the eve of a hard winter, which otherwise might have been aggravated by scarcity of labour and general distress.—*South Australian Register*, Sept. 12.

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